CLAIMS

1. A block copolymer produced by adding an alkenyl-containing polymer (I) to a living radical polymerization system or a living cationic polymerization system.

2. The polymer according to Claim 1, wherein the alkenyl group in said polymer (I) is represented by the general formula 1:

$$H_2C=C(R^1)- \quad (1)$$

(wherein R^1 is a hydrogen atom or a hydrocarbon group containing 1 to 20 carbon atoms).

3. The polymer according to Claim 2, wherein, in the general formula 1, R^1 is a hydrogen atom.

4. The polymer according to ~~any of Claims 1 to 3~~ Claim 1, wherein the alkenyl group in the polymer (I) is not activated by any of a carbonyl group, an alkenyl group and an aromatic ring each conjugated with the carbon-carbon double bond thereof.

5. The polymer according to ~~any of Claims 1 to 4~~ Claim 1, wherein the alkenyl group in said polymer (I) is located at a terminus of the polymer (I).

6. The polymer according to ~~any of Claims 1 to 5~~ Claim 1, wherein the polymerization system to which the polymer (I) is to be added is a living radical polymerization system.

7. The polymer according to Claim 6, wherein the living radical polymerization system is an atom transfer radical polymerization system.

8. The polymer according to Claim 7, wherein the polymer (I) has a group capable of serving as an initiator group for

atom transfer radical polymerization, and the product block copolymer is a multiblock copolymer.

9. The polymer according to Claim 8, wherein the group in polymer (I) which is capable of serving as an initiator group for atom transfer radical polymerization is represented by the general formula 2:

$$-C(Ar)(R^2)(X) \qquad (2)$$

(wherein Ar is an aryl group, which may optionally have a substituent, R^2 is a hydrogen atom or a hydrocarbon group containing 1 to 20 carbon atoms and X is chlorine, bromine or iodine).

10. The polymer according to Claim 8, wherein the group in polymer (I) which is capable of serving as an initiator group for atom transfer radical polymerization is represented by the general formula 3:

$$-C(CO_2R)(R^2)(X) \qquad (3)$$

(wherein R^2 is a hydrogen atom or a methyl group, R is an organic group containing 1 to 20 carbon atoms and X is chlorine, bromine or iodine).

11. The polymer according to Claim 9 ~~or 10~~, wherein, in the general formulas 2 and 3, R^2 is a hydrogen atom.

12. The polymer according to ~~any of Claims 7 to 11~~ Claim 7, wherein the metal complex to serve as a catalyst for atom transfer radical polymerization is a copper, nickel, ruthenium or iron complex.

13. The polymer according to Claim 12, wherein the metal complex to serve as a catalyst for atom transfer radical polymerization is a copper complex.

14. The polymer according to ~~any of Claims 6 to 13~~ Claim 6,

wherein the monomer to be polymerized in the living radical polymerization system is a (meth)acrylic monomer.

15. The polymer according to Claim 1 ~~any of Claims 1 to 5~~, wherein the polymerization system to which the polymer (I) is to be added is a living cationic polymerization system.

16. The polymer according to Claim 15, wherein the polymer (I) has a group capable of serving as an initiator group for living cationic polymerization and the product block copolymer is a multiblock copolymer.

17. The polymer according to Claim 16, wherein the group in polymer (I) which is capable of serving as an initiator group for living cationic polymerization is represented by the general formula 2:

$$-C(Ar)(R^2)(X) \qquad (2)$$

(wherein Ar is an aryl group, which may optionally have a substituent, R^2 is a hydrogen atom or a hydrocarbon group containing 1 to 20 carbon atoms and X is chlorine, bromine or iodine).

18. The polymer according to Claim 1 ~~any of Claims 1 to 17~~, wherein the polymer (I) is produced by controlled radical polymerization.

19. The polymer according to Claim 18, wherein the polymer (I) comprises a vinyl polymer produced by atom transfer radical polymerization.

20. The polymer according to Claim 19, wherein the polymer (I) is produced by atom transfer radical polymerization using an alkenyl-containing initiator.

21. The multiblock copolymer according to Claim 20,

wherein the polymer (I) is produced by using an allyl halide as an initiator.

22. The polymer according to ~~any of Claims 1 to 17~~ Claim 1, wherein the polymer (I) is produced by living cationic polymerization.

23. The polymer according to Claim 22, wherein the polymer (I) produced by living cationic polymerization is selected from the group consisting of styrenic polymers, isobutylene polymers, polyether polymers and vinyl ether polymers.

24. The polymer according to ~~any of Claims 1 to 17~~ Claim 1, wherein the polymer (I) is a vinyl polymer.

25. The polymer according to ~~any of Claims 1 to 17~~ Claim 1, wherein the polymer (I) is a polyolefin polymer.

26. The polymer according to ~~any of Claims 1 to 17~~ Claim 1, wherein the polymer (I) is a hydrocarbon polymer.

27. The polymer according to ~~any of Claims 1 to 17~~ Claim 1, wherein the polymer (I) is a polyester polymer.

28. The polymer according to ~~any of Claims 1 to 17~~ Claim 1, wherein the polymer (I) is a polyether polymer.

29. The polymer according to ~~any of Claims 1 to 17~~ Claim 1, wherein the polymer (I) is a polysiloxane polymer.

30. The polymer according to ~~any of Claims 1 to 29~~ Claim 1, wherein the polymer (I) has a glass transition point not lower than 25℃ and the polymer chain newly produced by atom transfer radical polymerization with the addition of polymer (I) has a

glass transition point not higher than 25℃, or the polymer (I) has a glass transition point not higher than 25℃ and the polymer chain newly produced by atom transfer radical polymerization with the addition of polymer (I) has a glass transition point not lower than 25℃.

31. A thermoplastic elastomer which comprises, as the main component thereof, the polymer according to ~~any of Claims 1 to 30~~.

32. An impact resistance improving agent which comprises, as the main component thereof, the polymer according to ~~any of Claims 1 to 30~~.